Software Testing and Verification

Problem Set 4: Path Conditions and Symbolic Evaluation

1. a.

i. T,T,T,T,F

$X_{1,1} = X_0$
$Y_{1,1} = Y_0+X_0$

$X_{1,2} = X_{1,1} = X_0$
$Y_{1,2} = Y_{1,1}+X_{1,1} = Y_0+2X_0$

ii. T,F,T,T,F

$X_{2,1} = X_0 -1.0$
$Y_{2,1} = Y_0$

$X_{1,2} = X_{2,1} = X_0 -1.0$
$Y_{1,2} = Y_{2,1} +X_{2,1} = Y_0+X_0 -1.0$

iii. T,T,T,F,F

$X_{1,1} = X_0$
$Y_{1,1} = Y_0+X_0$

$X_{2,2} = X_{1,1}-1.0 = X_0 -1.0$
$Y_{2,2} = Y_{1,1} = Y_0+X_0$

b.

path condition for T,T,T,T,F :

$(Y_0>0.0) \wedge (X_0<0.0) \wedge (Y_{1,1}>0.0) \wedge (X_{1,1}<0.0) \wedge (Y_{1,2}\leq 0.0)$
$= (Y_0>0.0) \wedge (X_0<0.0) \wedge (Y_0+X_0>0.0) \wedge (X_0<0.0) \wedge (Y_0+2X_0\leq 0.0)$
$= (Y_0>0.0) \wedge (X_0<0.0) \wedge (Y_0>-X_0) \wedge (Y_0\leq -2X_0)$

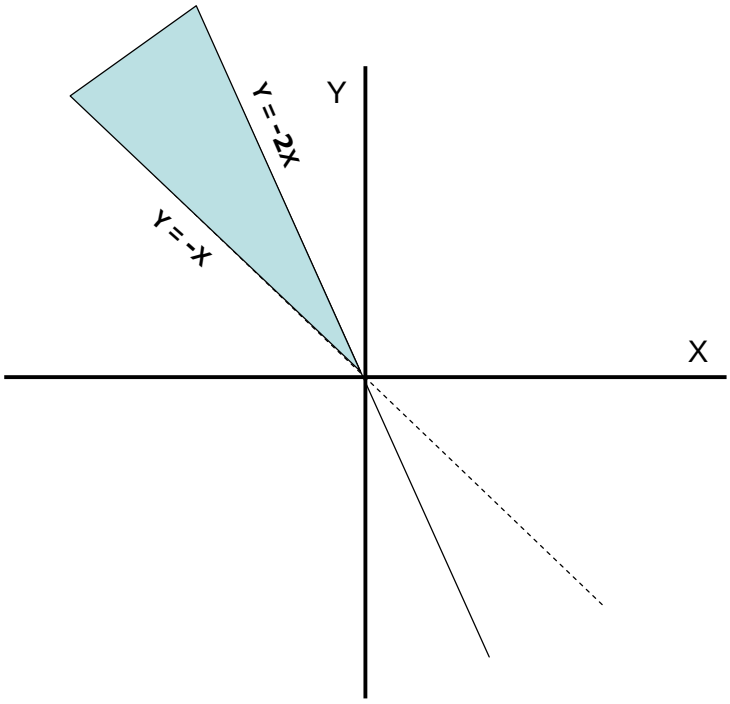
path condition for T,F,T,T,F :

$(Y_0>0.0) \wedge (X_0\geq 0.0) \wedge (Y_{2,1}>0.0) \wedge (X_{2,1}<0.0) \wedge (Y_{1,2}\leq 0.0)$
$= (Y_0>0.0) \wedge (X_0\geq 0.0) \wedge (X_0<1.0) \wedge (Y_0\leq -X_0+1.0)$

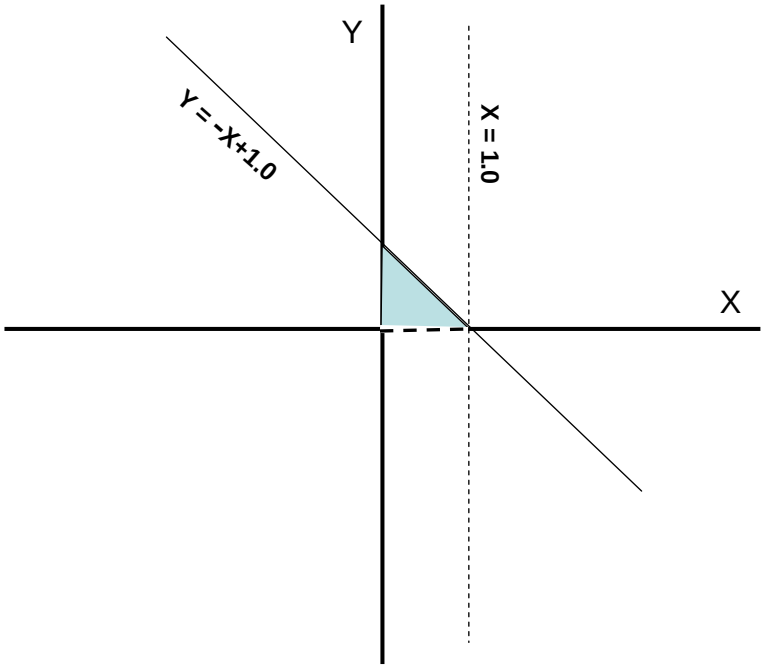
path condition for T,T,T,F,F :

$(Y_0>0.0) \wedge (X_0<0.0) \wedge (Y_{1,1}>0.0) \wedge (X_{1,1}\geq 0.0) \wedge (Y_{2,2}\leq 0.0)$
$= (Y_0>0.0) \wedge (X_0<0.0) \wedge (Y_0+X_0>0.0) \wedge (X_0\geq 0.0) \wedge (Y_0+X_0\leq 0.0)$
= False

c.



d.



2. a. $(Y>0) \wedge (X\geq 0) \wedge (Y>0) \wedge (X-1\geq 0) \wedge (Y>0) \wedge (X-2<0) \wedge (Y+X-2 \leq 0)$
$= (Y>0) \wedge (1\leq X<2) \wedge (Y+X-2 \leq 0)$

b. (1,1)